

Medical Situational Awareness in Theater Advanced Concept Technology Demonstration Project Proposal

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ABSTRACT

There is a need for greater medical situation awareness in theater and for greater integration of theater medical information into the net-centric rapid communications structure envisioned by DoD. Current information systems are not well integrated and do not provide optimal trend analysis or alerts that identify health and readiness risks that can be rapidly used by Combatant Commanders and by Joint Command Medical Departments. This project is designed to apply maturing data collection, communication, and computer-based decision aids to solve important medically-related military problems. An Advanced Concept Technology Demonstration (ACTD) Project is proposed to solve the problem of medical information fusion and communication for medical situation awareness in the theater.

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1.0 INTRODUCTION

Combatant Commanders lack timely, complete, actionable health information for operational decision-making, thereby putting troops at unnecessary risk for illness or injury and jeopardizing force strength and morale. There is a need for greater Medical Situation Awareness in theater and for greater integration of theater medical information into the ForceNet (i.e., a net-centric, rapid communications structure) structure envisioned in current DoD planning. Current information systems are not well integrated and do not provide optimal trend analysis or immediate warning alerts that identify risks that can be readily be used by Combatant Commanders and by Fleet Surgeons. Advanced Concept Technology Demonstrations (ACTDs) are designed to exploit maturing technologies to solve important military problems. An Advanced Concept Technology Demonstration Project is proposed to solve the problem of medical information fusion and communication for medical situation awareness in the theater.

ACTDs were first introduced in the Department of Defense in 1994 and were envisioned to be a pathway for mature technology to be rapidly introduced to solve new or persistent problems. Generally, an ACTD identifies a problem, maturing technologies that can address the problem, and brings together key partners. A competitive process is employed with final selection of ACTDs made by vote of Joint Combatant Commanders.

This proposed Medical Situation Awareness in Theater ACTD, brings together key sponsors, operational commanders, and medical research assets. These include:

- The Primary Sponsor, the Office of the Assistant Secretary of Defense, Deployment Health Support Directorate.
- The Technical Manager, United States Army Medical Research and Materiel Command.
- The Lead Investigative Center, the Naval Health Research Center.
- The Lead Operational Command, Pacific Command Surgeon.
- Transition Manager, the Joint Medical Information Systems Office.

The proposed project supports Joint operations by providing Joint commanders and staff with enhanced knowledge of the health readiness of their forces by generating information on emerging medical threats and health-related trends during deployment, so that when warranted, operational plans may be adjusted on a real-time basis. It also supports the Joint Force commander by providing medical threat and trend information during pre-deployment as well as for application to follow-on forces prior to their deployment into the Joint Operational Area. Another significant benefit of collecting and archiving this information in a standard manner is that it can be used to develop support plans for future operations and to support post-conflict studies and research.

2.0 PROBLEM

Current field medical data systems and domains that do not connect well include: medical intelligence, occupational and environmental hazard monitoring, chemical and biological threat monitoring, trauma reporting, disease and non-battle injury data, personnel unit and location data, and other critical data. These data are generally collected by different agencies, often sporadically, and are not universally shared, making it an impossible task to sort, understand, and generate actionable knowledge within operational timeframes.

3.0 CANDIDATE TECHNOLOGIES

This project recognizes that the concepts in ForceNet require near instantaneous collection, communication, analysis, and advanced computer-driven decision aids that can provide an integrated picture of the theater of operation. Mature technologies exist today that can begin to solve the problem. The use of these technologies must be closely linked to concepts of operation that take advantage of new technologies. Each of the Services has developed interim data capture capability in medical and non-medical areas pertinent to this project. The analysis of the disparate data and the reporting of results will allow protective measures to be implemented and factored into the medical and operational status of a deployed Joint Force. Several key elements include: Potential technology contributors include:

- Net-centric Communications and Control
- Service-specific Field Medical Data Systems
- Common Medical Operating Picture
- Joint Medical Workstation (JMEWS)
- Transportation Command Regulating and Evacuation System (TRAC2ES)

See Figure 1 below.

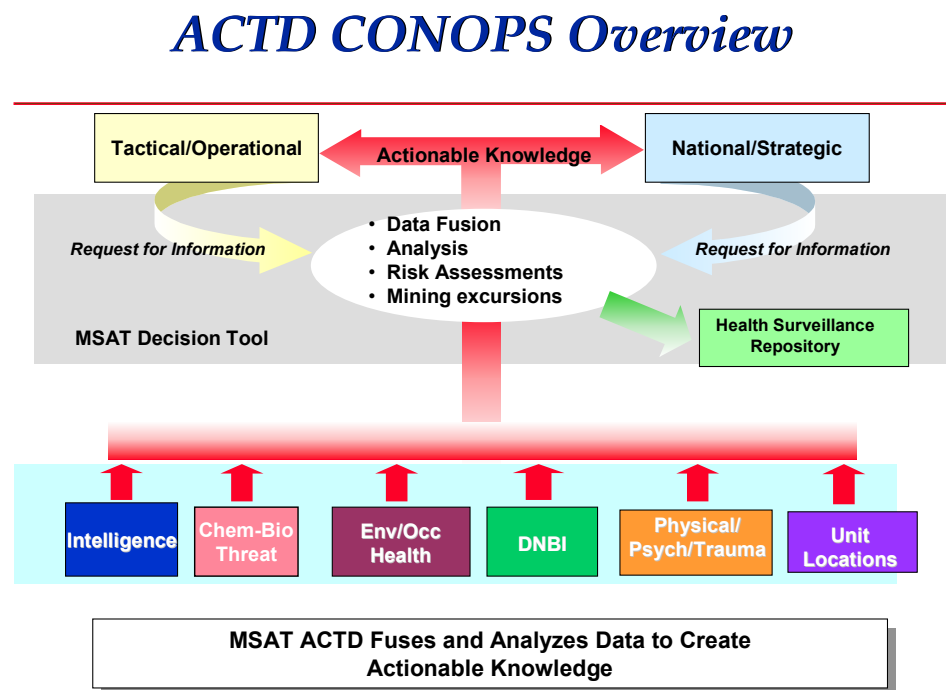
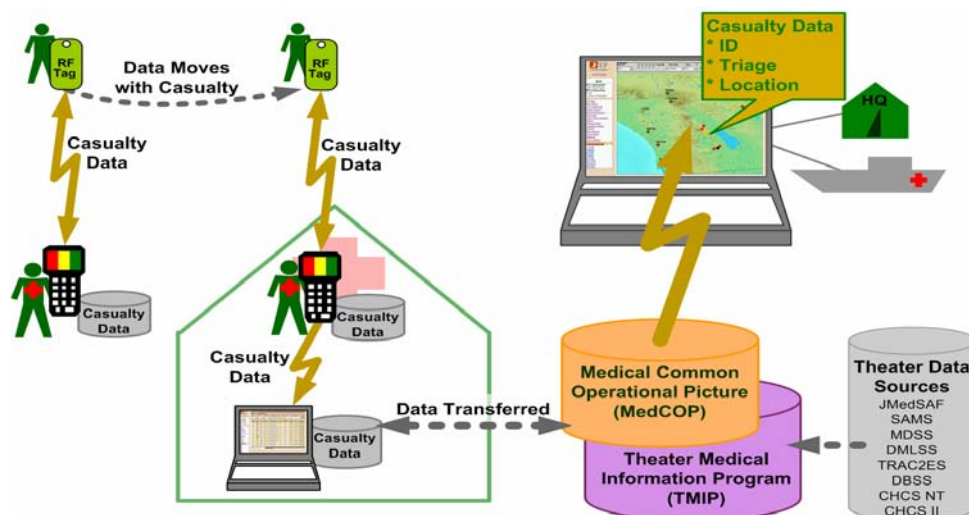


Figure 1: ACTD CONOPS Overview.

Currently a number of commercial technologies exist or are being developed that may support the project and they will be exploited; they include: Gemini/Modernized Integrated Database; fusion applications; artificial

intelligence capabilities; web-enabling technologies; sensor and point-of-use data capture technologies; and technologies for the capture and analysis of physiological changes.

The project will fuse current and emerging technologies and apply artificial intelligence and computerized decision support systems to transform collected, scattered data into timely, actionable information and knowledge. Secondly, as a by-product, the project will archive the data to establish a DoD repository for health surveillance information that provides reach back capability to Joint Force and Combatant Commanders, Joint Staff, the Services, the Office of the Secretary of Defense, and others. The project Concept of Operations (CONOPS) overview is depicted in Figure 2.



Example of Medical Data Flow in Theater

Figure 2: Medical Data Flow in Theater.

4.0 PROJECT SCHEDULE

During the first year of the project, the project will refine the architecture and identify new and sufficiently mature technologies for possible insertion or integration into the project concept. By the last quarter of the first year we will stand up the Medical Situational Awareness System and begin the first of a series of field trials to determine the utility of the technologies and the concept for the fusing, and trending, and archiving of information. These activities will continue through the second and third years (FY06 and FY07) with a full concept demonstration of the capabilities of the technology and associated tactics, techniques, and procedures in a Joint exercise or operation scheduled to begin in FY07.

5.0 IDENTIFICATION OF POTENTIAL MEASURES OF EFFECTIVENESS AND PERFORMANCE

Measures of effectiveness will be developed for:

- Ability and time required to identify, communicate, and react to immediate and emerging medical and environmental health care threats.
- Ability to combine, communicate, and process data from currently disparate systems.
- Ability to provide situational awareness of health hazards to Joint Force commanders.
- Degree to which units and personnel assigned to those units can be identified with exposures to occupational and environmental hazards.

Products with military utility will remain for COCOM use; the long term funding and support mechanisms currently identified will ensure operational capability remains throughout the extended user period. Additional residual capabilities include: continued refinements of the Medical Situational Awareness System; continued ability to populate the DoD Health Surveillance Repository and to share data with an emerging user base; capability to verify and adjust physiologically-based models that form the backbone of decision systems; and the availability of data for multiple longitudinal analyses (analysis of long-term health outcomes, new doctrine, enhanced training regimens, etc.).

This project will use spiral development to introduce and assess various capabilities over the period of field trials. Feasible technologies will be spun off for early field operational evaluation and implementation. Successful technologies and operational concepts may be transitioned early to an acquisition program of record for adoption and force structure fielding. The targeted program of record is the Joint Medical Information System. At the conclusion of the project, final recommendations on military utility will be provided to Combatant and Medical Commanders in theater.

